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PERIODONTOSIS: A CASE REPORT WITH SCANNING ELECTRON MICROSCOPIC--ETC(U)
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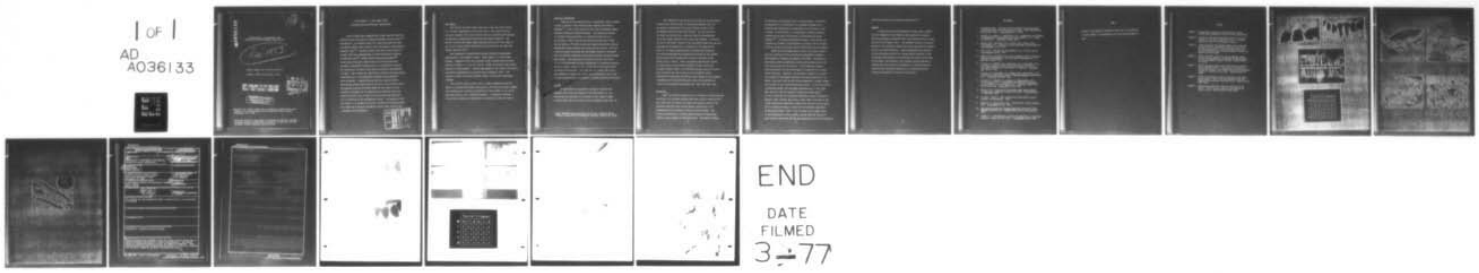

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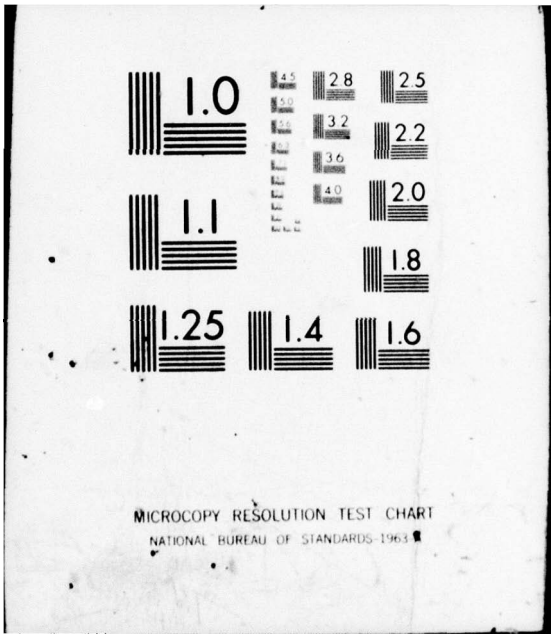
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Periodontosis: A Case Report With Scanning Electron Microscopic Observations

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Periodontosis: A Case Report with Scanning Electron Microscopic Observations

Recent studies have suggested that rather specific bacterial populations may be related to varying periodontal disease states.[1-3] Periodontosis, as defined by Baer,[4] has been associated with deep periodontal defects which contain a high percentage of gram-negative anaerobic rods.[3-5] Isolates of these rods have induced extensive alveolar bone loss accompanied by a marked osteoclastic response in germ-free rats.[6,7] Rather precise sampling techniques[3,8] and electron microscopic observations on extracted teeth have provided circumstantial evidence that the gram-negative organisms are located near the apex of the advancing lesion of periodontosis in humans. More information regarding the location and morphological characteristics of the subgingival organisms of periodontosis would be helpful in determining the possible cause and effect relationship between these bacteria and the clinical disease itself. The Scanning Electron Microscope (SEM) has been shown to be an excellent instrument for the examination of naturally occurring plaque structure,[9] yet no reports could be found concerning its use in evaluation of the periodontosis lesion. The purpose of this case report is to present the clinical finidngs and SEM observations of a tooth and associated periodontal tissues from a patient with a diagnosis of periodontosis.

Case Report

This 21-year old black female presented to Epes Army Dental Clinic for treatment complaining of "sore lower gums." Past medical history revealed an anemia of 5-6 years duration which has recently been diagnosed as hereditary elliptocytosis associated with minimal hemolysis. The patient recalled that spaces began developing between her front teeth at age 16 and previous dental extractions had occurred after the teeth had become "loose and sore."

Oral examination revealed normal mucosal surfaces and physiologic pigmentation of the gingival tissues. Teeth numbers 2, 3, and 30 were missing. Examination with the periodontal probe revealed severe vertical defects on numbers 9, 14, 24, 25, and 30. Plaque and calculus were evident, especially interproximally. Clinical photographs at the initial visit and an abbreviated radiographic survey may be seen in Figures 1 and 2. The patient's 19-year old sister presented similar clinical and radiographic findings.

Local factors, while present, did not appear commensurate with the amount of localized periodontal destruction in the molar and incisor regions. The treatment plan included the extraction of tooth numbers 9, 24, and 25 which were felt to have a hopeless prognosis. A periodontal charting of the maxillary incisors six weeks prior to extraction is shown in Table 1.

Materials and Methods

Tooth #9 was extracted securing a conservative intact V-shaped section of palatal tissue following the technique described by Ramfjord.[11] A soft tissue portion of the distal periodontal defect remained attached following extraction. The specimen was placed in chilled 2.5% glutaraldehyde in cacodylate buffer, pH 7.4, for 24 hours. After fixation the tooth was decalcified in EDTA for six weeks, at 4°C, then sliced into several longitudinal sections through the intact attached soft tissue and root surface. The soft tissue was gently reflected from the lingual surface of the tooth so as to minimize distortion of the pocket contents and the attached soft tissues. The speicmens were washed in buffer, post-fixed in 1% osmium tetroxide in buffer, dehydrated in increasing concentrations of alcohol, placed in amyl acetate and critical-point-dried in liquid carbon dioxide. The tooth with contiguous soft tissue was mounted on a sample stub, evaporation-coated with a thin layer of gold and palladium and examined in a scanning electron microscope.*

Results

A representative longitudinal section of tooth #9 with attached soft tissue was examined in the SEM (Figure 3). The soft tissue was observed to be attached to the lingual surface of decalcified root at the base of the periodontal pocket (Fig. 3).

* Model AMR-1000 Scanning Electron Microscope. Advanced Metals Research Corporation; 160 Middlesex Turnpike; Bedford, MA 01730

The attachment of the fibrous soft tissue of the periodontal ligament was clearly evident in the photomicrographs (Fig. 4). An extensive examination of the entire dental surface of the periodontal defect was made with the SEM. The root surface of the tooth was covered with scattered clumps of microorganisms of various shapes including rods, cocci and filaments. The apical portion of the dental surface of the periodontal defect was sparsely populated by red blood cells as observed at low magnification (Fig. 5). At higher magnifications rod-shaped microorganisms of uniform morphology were observed to be present on the cemental surface and on the disrupted soft tissues at the base of the defect (Figs. 6 and 7). These rod-shaped organisms were present in large clumps at the junction between the root surface and attached ligament fibers, and distributed evenly across the apical-most 0.44 mm of the root surface of the periodontal defect. Examination of the entire 0.2 mm^2 area just coronal to the ligament attachment and of the adjoining soft tissue in the SEM did not reveal any microorganism morphology other than these short rods.

Discussion

Baer[4] has defined periodontosis as a disease of the periodontium occurring in an otherwise healthy adolescent, which is characterized by a rapid loss of alveolar bone about more than one tooth of the permanent dentition where the periodontal destruction is not commensurate with the amount of local irritants present. The clinical characteristics and past dental history of this patient conform in most respects to this definition. The medical finding

of hereditary elliptocytosis was an interesting one. Hereditary elliptocytosis is transmitted as an autosomal dominant trait affecting the erythrocytes causing them to be elliptical or oval in shape. In mild forms, it is apparently a harmless disorder, although occassionally the disease is associated with severe hemolysis.[12] The mild elliptocytosis present in this patient was probably an incidental finding because a review of the literature failed to reveal any previous reports associating the two diseases.

Based upon the probable age of onset, the similar involvement of a sibling, and the clinical and radiographic findings, the diagnosis of advanced periodontosis was made. Disruption of the pocket contents undoubtedly occurred during reflection of the soft tissues from the root surface. This disruption, however, would be unlikely to cause displacement of organisms in a coronal-apical direction. Therefore, the consistent finding of an almost pure culture of rod-shaped organisms in the apical portion of the defect, continuous with the soft tissue components is highly suggestive of their actual location within the pocket. It was not possible to determine whether the rod-shaped organisms seen in this study were identical with the organisms reported by Newman et al,[3] nor was it possible to distinguish morphologic groups of organisms. However, these findings specifically locate rods at the apex of the lesion and provides additional evidence that the lesion of periodontosis is characterized by a rather distinct microbial population. If this microbiologic component can be shown to be a major factor in the pathogenesis of this disease, perhaps both the "classical" molar-incisor involvement and the more generalized form of periodontosis

should be referred to as juvenile periodontitis.[13]

Summary

A tooth and associated periodontal tissues from a patient with the diagnosis of periodontosis was subjected to scanning electron microscopic evaluation after reflection of the soft tissue portion of the lingual defect. The cemental surface of the apical portion of the lesion was found to be heavily populated by markedly similar rod-shaped organisms. The microorganisms were observed to be continuously present in a coronal-apical direction as the transition from cementum to the attached soft tissues at the base of the defect were examined. These findings provide additional evidence that the lesion of periodontosis is characterized by a rather distinct microbial population of rod-shaped organisms located predominately at the base of the defect.

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TABLE

Results of periodontal probing six weeks prior to extraction of tooth number 9 and examination of tissue (pocket depth in mm.).

FIGURES

FIGURE 1: Photographs of maxillary and mandibular incisor region showing migration and soft tissue destruction.

FIGURE 2: Periapical radiograph demonstrating loss of osseous support in the incisor and molar areas. Previous extractions were for periodontal reasons.

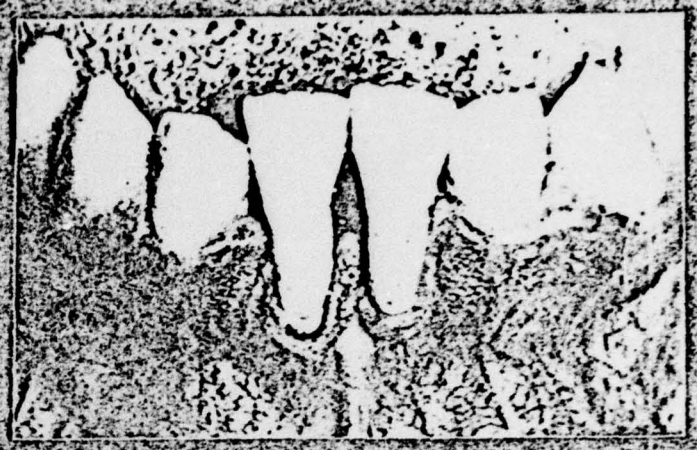
FIGURE 3: Scanning Electron Micrograph (SEM) of the extracted, decalcified root segment with attached soft tissue. The soft tissue wall of the periodontal defect (a) has been reflected away from the cemental surface (b). Magnification 24 times.

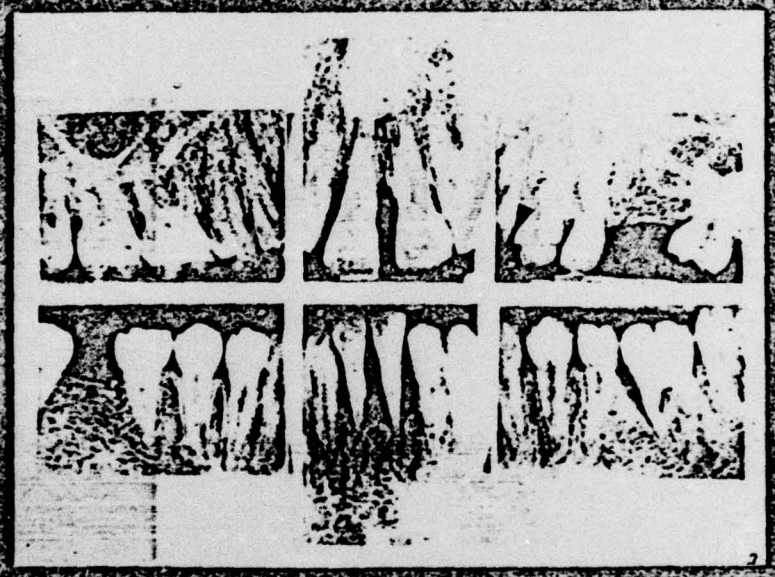
FIGURE 4: SEM of the apical region of the periodontal defect. The base of the defect is delineated by the presence of the periodontal ligament (arrow). Magnification 118 times.

FIGURE 5: SEM of the apical portion of the cemental surface of the periodontal defect. Occasional red blood cells are on the surface. The fibrous base of the periodontal ligament is marked by the arrow. Magnification 235 times.

FIGURE 6: SEM of the cemental surface at the base of the periodontal defect. Short rod-like organisms cover the cementum and occasional red blood cells. Magnification 6000 times.

FIGURE 7: SEM of the coronal-most tissue at the base of the defect. Short rod-like organisms are adjacent to these tissues. Magnification 12,000 times.





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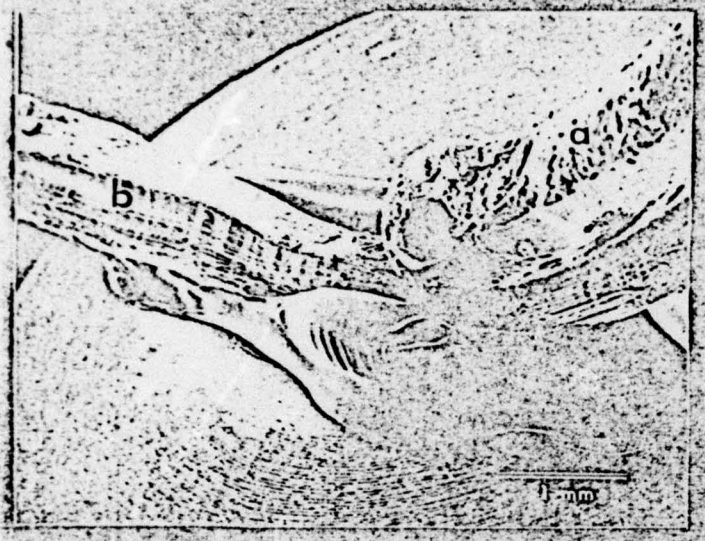
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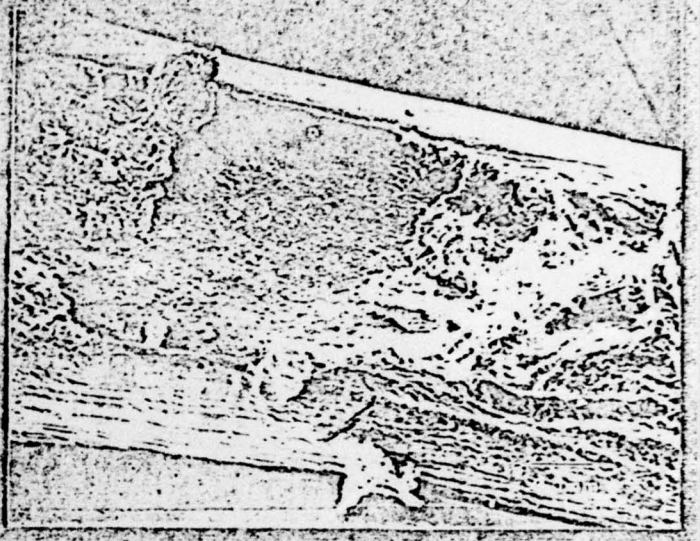

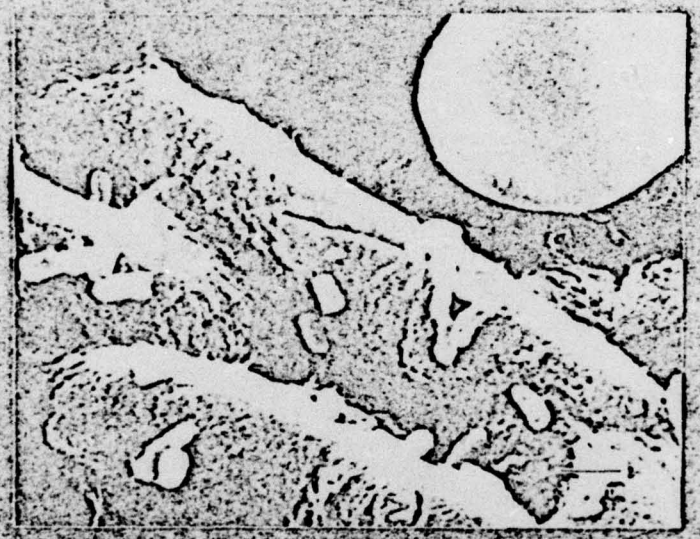

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Scanning microscopy was performed on the root surface of tooth removed due to severe periodontal destruction as a result of periodontosis. The cemental surface was covered with markedly similar rod shaped microorganisms. These findings provide additional evidence that this disease is caused by a characteristic bacteria, located at the base of the advancing lesion.

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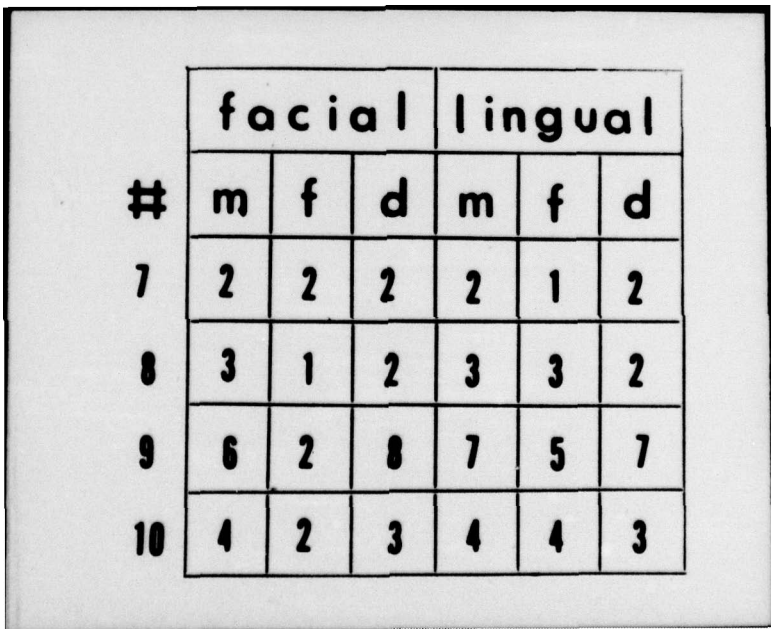

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